



results from the Commissioner exercising his judgment under the authority granted under 35 USC 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 C.F.R. §1.491 which states: "An international application enters the national state when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

**WARNING:** Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. §1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing - See 37 C.F.R. §1.8.

**NOTE:** Documents and fees must be clearly identified as a submission to enter the national state under 35 USC 371 otherwise the submission will be considered as being made under 35 USC 111. 37 C.F.R. § 1.494(f).

1. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. 371:

- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. 371(f)).
- b. ☒ The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2.Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
[ ]*	TOTAL CLAIMS	5- 20 =		x \$ 18.00 =	\$
	INDEPENDENT CLAIMS	1- 3 =		x \$ 80.00 =	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00				NOT PAID
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(2) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 CFR 1.492(a)(4)) ..... \$100.00 <input type="checkbox"/> and the above requirements are not met (37 CFR 1.492(a)(1)) ..... \$690.00  <input checked="" type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 CFR 1.492(a)(2)) ..... \$710.00 <input checked="" type="checkbox"/> has not been paid (37 CFR 1.492(a)(3)) ..... \$1,000.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) ..... \$860.00				
	Total of above Calculations				=1000.00
SMALL ENTITY	Reduction by ½ for filing by small entity, if applicable. Statement may also be filed. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				
	Total National Fee				\$1000.00
	Fee for recording the enclosed assignment document \$40.00 (37 CFR 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				\$1000.00

\*See attached Preliminary Amendment Reducing the Number of Claims.

- i. ☒ A check in the amount of \$1000.00 to cover the above fees is enclosed.
- ii. ☐ Please charge Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_.  
A duplicate copy of this sheet is enclosed.

**\*\*WARNING:** *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: \* \* \* (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended."* 37 C.F.R. § 1.495(b).

**WARNING:** *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. [ X ] A copy of the International application as filed (35 U.S.C. 371(c)(2)):

*NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

- a. ☐ is transmitted herewith.
- b. ☐ is not required, as the application was filed with the United States Receiving Office.
- c. ☒ has been transmitted
- i. ☒ by the International Bureau.  
Date of mailing of the application (from form PCT/IB/308): \_\_\_\_\_.
- ii. ☐ by applicant on \_\_\_\_\_.  
Date

4. [X] A translation of the International application into the English language (35 U.S.C. 371(c)(2)):
- a. [ ] is transmitted herewith.
- b. [X] is not required as the application was filed in English.
- c. [ ] was previously transmitted by applicant on \_\_\_\_\_.  
Date
- d. [ ] will follow.

JC18 Rec'd PCT/PTO 20 JUL 2001

5. [ X ] Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
- b. ☐ have been transmitted
- i. ☐ by the International Bureau.  
Date of mailing of the amendment (from form PCT/IB/308): \_\_\_\_\_.
- ii. ☐ by applicant on \_\_\_\_\_.  
Date
- c. ☒ have not been transmitted as
- i. ☒ applicant chose not to make amendments under PCT Article 19.  
Date of mailing of Search Report (from form PCT/ISA/210): MAY 22, 2000.
- ii. ☐ the time limit for the submission of amendments has not yet expired.  
The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.
6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. 371(c)(3)):
- a. ☐ is transmitted herewith.
- b. ☐ is not required as the amendments were made in the English language.
- c. ☒ has not been transmitted for reasons indicated at point 5(c) above.
7. ☒ A copy of the international examination report (PCT/IPEA/409)
- ☒ is transmitted herewith.
- ☐ is not required as the application was filed with the United States Receiving Office.
8. ☒ Annex(es) to the international preliminary examination report
- a. ☒ is/are transmitted herewith.
- b. ☐ is/are not required as the application was filed with the United States Receiving Office.
9. ☒ A translation of the annexes to the international preliminary examination report
- a. ☐ is transmitted herewith.
- b. ☒ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. 371(c)(4)) complying with 35 U.S.C. 115
- a. ☐ was previously submitted by applicant on \_\_\_\_\_.  
Date
- b. ☐ is submitted herewith, and such oath or declaration
- i. ☐ is attached to the application.
- ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. 1.70.
- c. ☒ will follow.

Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☒ is transmitted herewith.
- b. ☐ has been transmitted by the International Bureau.  
Date of mailing (from form PCT/IB/308): \_\_\_\_\_.
- c. ☐ is not required, as the application was searched by the United States International Searching Authority.
- d. ☐ will be transmitted promptly upon request.
- e. ☐ has been submitted by applicant on \_\_\_\_\_.  
Date
12. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98:
- a. ☒ is transmitted herewith.  
Also transmitted herewith is/are:
- ☒ Form PTO-1449 (PTO/SB/08A and 08B).
- ☒ Copies of citations listed.
- b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. 371(c).
- c. ☐ was previously submitted by applicant on \_\_\_\_\_.  
Date
13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- ## RESPONSE WRITTEN OPINION

- (Transmittal Letter to the United States Elected Office (EO/US)—page 7 of 8) 13-18

only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

- ☒ 37 C.F.R. 1.17 (application processing fees)  
☒ 37 C.F.R. 1.17(a)(1)-(5)(extension fees pursuant to § 1.136(a).  
☒ 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

- [ ] 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

  
 SIGNATURE OF PRACTITIONER

William R. Evans

(type or print name of practitioner)

Reg. No.: 25,858

Tel. No.: (212) 708-1930

Customer No.: 00140

P.O. Address

c/o Ladas & Parry  
 26 West 61<sup>st</sup> Street  
 New York, N.Y. 10023



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JC10 Rec'd PCT/PTO 13 AUG 2001  
09/889755

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Ole HJERTHOLM

Serial No.: 09/889,755

Group No.:

Filed: July 20, 2001

Examiner.:

For: SEALING ARRANGEMENT

Attorney Docket No.: U 013557-0

Assistant Commissioner for Patents

Washington, D.C. 20231

BOX PCT

PRELIMINARY AMENDMENT

Please amend the above application as follows.

IN THE CLAIMS

1. (amended)            Sealing arrangement (10, 10') comprising two separate armature members (11, 12) and a sealing ring (13, 13') interposed therebetween and a clamping device (30) for clamping the armature members (11, 12) against each other causing the intermediate sealing ring (13,13') to be loaded with a sealing force, said sealing ring (13, 13') being made of metal or similar material and having a substantially

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the:  
Assistant Commissioner of Patents and Trademarks, Washington, D.C. 20231

WILLIAM R. EVANS

(Type or print name of person mailing paper)

Date: August 9, 2001

  
(Signature of person mailing paper)

T-shaped annular cross-section, said T-shape provided with two in opposite axial direction extending sealing wings (15, 16), each with an radially outwards facing sealing face (15a, 15b), and therebetween a central, rather rigid stem (14) extending radially outwards and being provided with a combined gliding and support face (14a) to be supported against a counter face (22) in the sealing arrangement, each of said sealing faces (15a, 15b) being conically shaped to be supported against a radially surrounding, correspondingly conically shaped gliding and support face (21, 25) in a corresponding armature member (11, 12), each of said conical support faces (21, 25) of said armature members (11, 12) extends under a first, smallest cone angle (a), whereas each of said sealing wings (13, 13') extends under a second, greatest cone angle (b), prior to mounting, and after mounting extends under said first cone angle (a) to form a tight sealing abutment against its corresponding support face (21, 25), characterized in that

each sealing face (15a, 16a) of said sealing ring (13, 13') has the same axial extension as that of the associated sealing wing (15, 16), and

each sealing face (15a, 16a) has a continuous, rectilinear extension in axial direction of the sealing wing (15, 16), and

each sealing wing (15a, 16a) is tapering in axial direction from the stem (14) and is elastically deformable in relation to the stem (14) in order to secure a controlled elastic deformation of the sealing wing (15, 16).

2. (amended) Arrangement in accordance with claim 1, characterized in that

each sealing wing (15, 16) in radial direction has a relatively small cross-

sectional dimension, increasing from a minimum at its outer end portion to a maximum at its inner end portion by the stem (14), and

each sealing wing (15, 16) in a axial direction has a relatively large cross-sectional dimension, to obtain support of the sealing wings (15, 16) along a major area of the respective support surfaces (21, 25).

both cross-sectional dimension being relative in respect of the cross-sectional dimensions of the stem (14), which in axial as well as in radial direction is relatively large to provide a rather rigid stem (14).

3. (amended) Arrangement in accordance with claim 1, characterized in that the counter face (22) extends continuously in axial direction and solely in one of the armature members (11, 12), providing a continuous gliding support for the support face (14a) of the stem (14) directly against said counter face (22).

4. (amended) Arrangement in accordance with claim 1, characterized in that the clamping means (30) comprises two in radial direction mutually overlapping armature member portions (26, 27) extending radially outside of the sealing ring (13, 13'),

said armature member portions (26, 27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stopp forming abutment between the armature member (11, 12).

5. (amended) Arrangement in accordance with claim 1, characterized in that the combination of the oblique extension of said mutually overlapping, stop forming armature member portions (26, 27) and said elastically deformable wings (15, 16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing arrangement during use.

Please add the following claims:

6. (new) Arrangement in accordance with claim 2, characterized in that the counter face (22) extends continuously in axial direction and solely in one of the armature members (11, 12), providing a continuous gliding support for the support face (14a) of the stem (14) directly against said counter face (22).

7. (new) Arrangement in accordance with claim 2, characterized in that the clamping means (30) comprises two in radial direction mutually overlapping armature member portions (26, 27) extending radially outside of the sealing ring (13, 13'),  
said armature member portions (26, 27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stop forming abutment between the armature member (11, 12).

8.(new) Arrangement in accordance with claim 3, characterized in that the clamping means (30) comprises two in radial direction mutually overlapping armature member portions (26, 27) extending radially outside of the sealing ring (13, 13'),

said armature member portions (26, 27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stop forming abutment between the armature member (11, 12).

9. (new) Arrangement in accordance with claim 6, characterized in that the clamping means (30) comprises two in radial direction mutually overlapping armature member portions (26, 27) extending radially outside of the sealing ring (13, 13'),

said armature member portions (26, 27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stop forming abutment between the armature member (11, 12).

10. (new) Arrangement in accordance with claim 2, characterized in that the combination of the oblique extension of said mutually overlapping, stop forming armature member portions (26, 27) and said elastically deformable wings (15, 16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing arrangement during use.

11. (new) Arrangement in accordance with claim 3, characterized in that  
the combination of the oblique extension of said mutually overlapping, stop  
forming armature member portions (26, 27) and said elastically deformable wings (15,  
16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing  
arrangement during use.

12. (new) Arrangement in accordance with claim 4, characterized in that  
the combination of the oblique extension of said mutually overlapping, stop  
forming armature member portions (26, 27) and said elastically deformable wings (15,  
16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing  
arrangement during use.

13. (new) Arrangement in accordance with claim 6, characterized in that  
the combination of the oblique extension of said mutually overlapping, stop  
forming armature member portions (26, 27) and said elastically deformable wings (15,  
16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing  
arrangement during use.

14. (new) Arrangement in accordance with claim 9, characterized in that  
the combination of the oblique extension of said mutually overlapping, stop  
forming armature member portions (26, 27) and said elastically deformable wings (15,  
16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing  
arrangement during use.

REMARKS

The above amendatory action is taken solely for the purpose of avoiding claim fees that would otherwise accrue due to the presence of multiple dependent claims.

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'W. Evans', written over a horizontal line.

WILLIAM R. EVANS  
LADAS & PARRY  
26 WEST 61ST STREET  
NEW YORK, NEW YORK 10023  
REG. NO. 25,858 (212)708-1887

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1. (amended) Sealing arrangement (10, 10') comprising two separate armature members (11, 12) and a sealing ring (13, 13') interposed therebetween and a clamping device (30) for clamping the armature members (11, 12) against each other causing the intermediate sealing ring (13,13') to be loaded with a sealing force, said sealing ring (13, 13') being made of metal or similar material and having a substantially T-shaped annular cross-section, said T-shape provided with two in opposite axial direction extending sealing wings (15, 16), each with an radially outwards facing sealing face (15a, 15b), and therebetween a central, rather rigid stem (14) extending radially outwards and being provided with a combined gliding and support face (14a) to be supported against a counter face (22) in the sealing arrangement, each of said sealing faces (15a, 15b) being conically shaped to be supported against a radially surrounding, correspondingly conically shaped gliding and support face (21, 25) in a corresponding armature member (11, 12), each of said conical support faces (21, 25) of said armature members (11, 12) extends under a first, smallest cone angel (a), whereas each of said said sealing wings (13, 13') extends under a second, greatest cone angel (b), prior to mounting, and after mounting extends under said first cone angle (a) to form a tight sealing abutment against its corresponding support face (21, 25), [characterised in that] characterized in that

each sealing face (15a, 16a) of said sealing ring (13, 13') has the same axial extension as that of the associated sealing wing (15, 16), and

each sealing face (15a, 16a) has a continuous, rectilinear extension in axial direction of the sealing wing (15, 16), and

each sealing wing (15a, 16a) is tapering in axial direction from the stem (14)

and is elastically deformable in relation to the stem (14) in order to secure a controlled elastic deformation of the sealing wing (15, 16).

2. (amended) Arrangement in accordance with claim 1, [characterised in that]  
characterized in that

each sealing wing (15, 16) in radial direction has a relatively small cross-sectional dimension, increasing from a minimum at its outer end portion to a maximum at its inner end portion by the stem (14), and

each sealing wing (15, 16) in a axial direction has a relatively large cross-sectional dimension, to obtain support of the sealing wings (15, 16) along a major area of the respective support surfaces (21, 25).

both cross-sectional dimension being relative in respect of the cross-sectional dimensions of the stem (14), which in axial as well as in radial direction is relatively large to provide a rather rigid stem (14).

3. (amended) Arrangement in accordance with claim 1 [or 2, characterised in that] , characterized in that

the counter face (22) extends continuously in axial direction and solely in one of the armature members (11, 12), providing a continuous gliding support for the support face (14a) of the stem (14) directly against said counter face (22).

4. (amended) Arrangement in accordance with [one of claims 1-3, characterised in that] claim 1, characterized in that

the clamping means (30) comprises two in radial direction mutually

overlapping armature member portions (26, 27) extending radially outside of the sealing ring (13, 13'),

said armature member portions (26, 27) is supporting each other along mutually opposite conical support surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stop forming abutment between the armature member (11, 12).

5. (amended) Arrangement in accordance with [one of claims 1-3 and claim 4, characterised in that] claim 1, characterized in that

the combination of the oblique extension of said mutually overlapping, stop forming armature member portions (26, 27) and said elastically deformable wings (15, 16) of the sealing ring (13, 13') to provide controlled gliding movements in the sealing arrangement during use.

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Sealing Arrangement.

Present invention relates to a sealing arrangement comprising two separate armature members and a sealing ring interposed therebetween and a clamping device for clamping the armature members against each other causing the intermediate sealing ring to be loaded with a sealing force, said sealing ring being made of metal or similar material and having a substantially T-shaped annular cross-section, said T-shape being provided with two in opposite axial direction extending sealing wings, each with an radially outwards facing sealing face and therebetween a central, rather rigid stem extending radially outwards and being provided with a combined gliding and support face to be supported against a counter face in the sealing arrangement, each of said sealing faces being conically shaped to be supported against a radially surrounding, correspondingly conically shaped gliding and support face in a corresponding armature member, each of said conical support faces of said armature members extends under a first, smallest cone angle, whereas each of said said sealing wings extends under a second, greatest cone angle, prior to mounting, and after mounting extends under said first cone angle to form a tight sealing abutment against its corresponding support face.

The present invention finds its application in a series of different areas of use, that is to say during moderate working conditions as well as during extreme working conditions.

The expression " armature members " is employed herein for indicating that there are under discussion

SUBSTITUTION SHEET.

AMENDED SHEET

[illegible]

AMENDED SHEET

During moderate working conditions there can be employed for example a sealing ring of rigid plastic or another suitable material, while under extreme working conditions, for example in a pipe coupling, there can be employed according to the illustrated embodiment a metallic sealing ring.

It is generally known to employ a metallic sealing ring of T - shaped annular cross-section in an intermediate space between two opposite coupling pieces of a pipe coupling. Such a pipe coupling can be used for example when high pressure and tensile loadings occur axially in the pipe coupling and when at the same time extreme internal medium pressure can occur in the joint between the coupling pieces/the armature members. In what follows " coupling piece " will be indicated as armature member.

An example of such a known solution is shown in NO 178 388. Therein it is shown that the stem of the T-shape is clamped together via opposite side faces, in the axial direction of the pipe coupling, at the same time as laterally directed sealing flaps of the T-shape are clamped each via its cone face in the axial direction and radial direction of the pipe coupling for sealing abutment against a respective cone face of a stopper of a respective armature member.

An other example of such known solution is shown in AU 392 143. It is suggested therein that the sealing faces of the sealing wings of the sealing ring has a cone angle of  $1^{\circ}$ - $2^{\circ}$  steeper than that of the support face of the armature members. This will or may result in permanent deformation of the sealing ring in cases wherein the sealing faces are loaded with extreme pressure load. In practice this will involve that the sealing ring during mounting or hence during use is over-loaded and destroyed by exceeding the yield point of the metallic sealing ring and the latter is to be shifted. This will involve a time consuming and expensive shifting operation, especially in oil and gass drilling operations.

SUBSTITUTION SHEET

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It is to to be noted, with reference to AU 392 143,  
that said sealing faces are solely located at the outer  
ends of the sealing wings, i.e. at a considerable distance  
from the sealing ring stem. By spacing the conic faces of  
5 the armature members from the conic faces of the inner  
portion of the sealing wing over a considerable axial  
distance the sealing face area is clearly restricted and  
an intended high moment force is achieved in the sealing  
face area. Such high sealing forces, when occurring as  
10 instantaneous peak pressures in gass or oil drilling  
pipes, may quite often cause permanent deformation of the  
sealing ring and a following leaking that will require  
shifting of a destroyed sealing ring.

By clamping together the stem of the T-shape in the  
15 axial direction the sealing ring is locked in place in the  
intended use position, that is to say in an intended  
immovable use position. At the same time by arrangement of  
the sealing flaps in a sealing abutment against the

SUBSTITUTION SHEET

AMENDED SHEET

armature members, the seal is precisely set in the immovable use position. Consequently the metallic sealing ring becomes locked in an immovable engagement with the respective armature members.

5       According to NO 178 388 the metallic sealing ring becomes subjected, during mounting, to an extremely high clamping pressure, so that the sealing ring becomes permanently deformed, that is to say by means of a clamping pressure which involves exceeding the yield  
10       strength of the metal. The metallic sealing ring becomes permanently deformed both in an axial and in a radial direction. During use in a pipe conduit any relative movement between the sealing ring and the adjacent armature members is consequently prevented, independently  
15       of which tensile or pressure forces which have an effect axially through the pipe coupling. In practice the function of the sealing ring will depend totally upon the sealing ring and the armature members being held the whole time in permanent clamping engagement with each other  
20       under a continued high clamping pressure. This function is ensured as long as the extremely high clamping pressure is maintained. On relief of the extremely high clamping pressure which is applied on the pipe coupling the sealing function is made inactive. This involves, during use, on  
25       extreme loads occurring axially though the armature members, in combination with varying extremely high internal medium pressures and/or significant temperature variations in the coupling pieces and the sealing ring, a breakage of the seal arising, with leakages following from  
30       this and also the need for repair. The repair which makes

it necessary to scrap the permanently deformed sealing ring, and possible damage, which is imposed on the coupling pieces, is rather time-consuming and rather expensive. This is particularly the case on use in a pipe conduit which is utilised in a drilling operation and/or in connection with transportation of gas/oil products from wells in the ocean.

In NO 303 150 a sealing arrangement is proposed for the afore-mentioned purpose, that is to say for use in a pipe conduit with associated pipe coupling during extreme conditions of use. In the sealing arrangement the afore-mentioned metallic sealing ring is omitted. Instead two armature members (coupling pieces) are employed, which form a direct sealing abutment with each other in a mutual sliding abutment via a conical sealing face of an elastically yielding ring portion of the one armature member. There is employed a conical supporting surface of a robust supporting portion of the other armature member. As a result of the slidable sealing engagement between the armature members, in combination with the elastically yielding sealing portion of the one armature member it is possible to ensure an effective sealing engagement during use of the pipe coupling.

This sealing effect can be achieved, even when extreme axial tensile and pressure forces occur between the armature members and even when significant temperature variations and extreme pressure variations occur in the pressure medium which passes through the pipe coupling.

Normally the sealing arrangement can be reemployed after use, that is to say after the introductory applied clamping force is relieved.

However, also according to NO 303 150, there are employed very high clamping pressures ( up towards the yield point of the metallic sealing portion of the coupling) during mounting, that is to say during the joining of the armature members, and also during the use itself of the pipe coupling. This is caused by the relatively rigid and relatively thick-walled sealing portion of the one coupling piece, which is to be subjected to elastic deformation.

By virtue of the different loadings, which occur in the pipe coupling during use, in combination with the slidable seal which is obtained between the armature members, there are employed in the known solution particularly high clamping pressures, that is to say as mentioned clamping pressures of an order of magnitude almost up to the yield point of the metallic material of the armature member having the elastically yielding sealing portion.

In the known solution the clamping pressure, that is to say the applied preliminary pressure, shall during use be able to compensate for occurring tensile forces and relative axial movements following from this between the sealing face and the stop face of the two armature members, at the same as an effective sealing off is ensured between the armature members.

On possibly exceeding the yield point of the material of the armature member/ members, the sealing function

between the armature members fails. The result is that at least the armature member with the elastically yielding sealing portion, must be replaced.

According to the invention the aim is a sealing  
5 arrangement, which inter alia can be employed for the same or similar purposes, as according to NO 303 150, and which can replace with advantage said known solution, based on an axially slidable sealing engagement.

According to the invention the aim is to utilise a  
10 separate, elastically yielding sealing ring, instead of an elastically yielding sealing portion of the one armature member according to NO 303 150.

In extreme cases the aim is to be able to replace  
15 only the sealing ring, in a manner known per se, on need, instead of having to replace the whole armature member with elastically yielding sealing portion, as is necessary according to NO 303 150.

In addition the aim is to be independent of the  
20 extremely high clamping pressures according to the known solution during mounting of the sealing elements and during use of the pipe coupling. This involves being able to achieve an effective sealing off of a substantially lower clamping pressure region based on an elastic  
25 adjustment between sealing abutment and various pressure and tensile loadings which occur axially though the armature members.

A further aim is to be able to employ a substantially  
30 simpler mounting technique according to the invention than according to the known solution, in combination with said substantially lower clamping pressure against the sealing

ring during use, than that which is a prerequisite according to NO 303 150.

However the solution according to the invention is not limited to such use, as indicated in NO 303 150, but  
5 can as mentioned above find application for a series of various other purposes. The sealing arrangement according to the invention can for example find application in areas where there is a need for substantially simpler sealing arrangements than proposed in said patent, but where in  
10 addition it is favourable having a slidable sealing engagement between sealing ring and armature members.

The sealing arrangement according to the invention is characterised in that each sealing face of said sealing ring has the same axial extension as that of the  
15 associated sealing wing, and each sealing face has a continuous, rectilinear extension in axial direction of the sealing wing, and each sealing wing is tapering in axial direction from the stem and is elastically deformable in relation to the stem in order to secure a  
20 controlled elastic deformation of the sealing wing.

According to the invention it is possible to obtain considerable advantages by allowing the sealing wings of the sealing ring to be deformed elastically in a controlled manner during mounting of the sealing ring as  
25 well as in use of the sealing ring under varying working conditions.

One advantage is that it is possible to operate the sealing arrangement in a controlled manner to keep occurring forces well beyond the yield point of the  
30 metallic sealing ring material.

An other advantage is especially achieved by allowing the sealing faces of the elastically deformable sealing ring to slide in a controlled manner along its associated support faces in the armature members. This is especially  
35 the case during existing high extern or intern temperature variations and/or under occurring extreme peak load situations within an associated gass or oil piping. By combining a controlled elastic deformation of the sealing

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wings and a controlled sliding support of the sealing ring in all of its counter faces it is in a surprisingly simple manner possible to operate occurring loads in a controlled manner beyond the yield point of the metallic sealing ring material.

5 In DE 37 23 386 it is suggested to provide a cavity in one of the armature members to insert the whole of the sealing ring therein. The radial support face of the sealing ring is supported in radial direction by an  
10 annular spring located in a radial groove in said cavity. Such suggestion will prevent a controlled gliding support of the sealing ring in said cavity.

This problem is solved according to the present invention in that said counter face extends continuously  
15 in axial direction and solely in one of the armature members to support the support face of the stem in a continuous gliding support directly against said counter face.

By means of the middle support and slide face, which  
20 is arranged in a sealing ring stem, which preferably is rigid and shape stable, it is possible during use for the sealing ring to move unhindered relative to each of the armature members, inter alia for equalising of, that is to

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say equally distributing of occurring sealing pressures on each of the sealing wings. This is the case even under extreme use conditions (extreme medium pressures in the coupling in combination with extreme loadings on the armature members).

By means of the elastically deformable sealing wings of the sealing ring in combination with said shape-stable and rigid stem, it is possible, by sliding movement of the sealing ring relative to the armature members, to ensure effective sealing off in various axially displaced sealing positions, according to need.

By means of the rigid stem an effective bracing of the middle main portion of the sealing ring can be ensured. By means of relatively slender sealing wings an elastic deformation of the sealing wings can be achieved in a relatively simple manner, even if the sealing ring is made of rather rigid material, such as metal, glass or rigid plastic.

According to the invention it is preferred to produce the sealing ring of the same material as the armature members, for example of metal, such as aluminium, or of a material, which has the same or substantially the same coefficient of thermal expansion as the material of the armature members. By this it is possible to subject the material of the armature members and the material of the sealing ring to similar or as far as possible similar expansion or contraction at varying temperature and pressure conditions.

Further features of the sealing arrangement according to the invention will be evident from the following

description with regards to the accompanying drawings, in which:

Fig. 1 shows a sealing arrangement according to the invention utilised in connection with an armature in the form of a pipe coupling, illustrated partly in side view and partly in longitudinal section.

Fig. 1a shows a section of two armature members in a joined position.

Fig. 2 shows the same as in Fig. 1, illustrated in perspective and partly in side view and partly in longitudinal section.

Fig. 3 shows a first armature member in longitudinal section.

Fig. 4 shows a second armature member in perspective.

Fig. 5 shows a clamping member in longitudinal section

Fig. 5a shows the clamping member according to Fig. 5 in plan view.

Fig. 6 shows a sealing ring, illustrated partly in side view and partly in longitudinal view.

Fig. 7 and 8 show the sealing ring according to Fig. 6 in plan view and in perspective view respectively.

Fig. 9 shows a section of Fig. 6 on a larger scale.

Fig. 10 illustrates the sealing arrangement according to the invention before joining together.

Fig. 11 illustrates the sealing arrangement according to the invention after joining together.

Fig. 12a - 12d show schematically four different stages of an axial clamping together of the armature members, illustrated with a pair of clamping means of the

one armature member and a pair of clamping means of the clamping member of the clamping device.

A sealing arrangement 10 according to the invention comprises, as is shown in Fig. 1, a first armature member 11 and a second armature member 12 plus an annular sealing ring 13. In addition a combined clamping and locking device 30 is employed in the sealing arrangement 10, which will be described in more detail further below in the description.

10 The sealing arrangement 10 according to the invention can be employed for different types of armatures, such as pipes, hoses, conduits, containers, cover members, and the like.

15 In a first embodiment, according to Fig. 1 - 9, the sealing arrangement 10 is shown in connection with an armature, which is in the form of a pipe coupling. Instead of designating the members as " pipe members ", there is employed herein, as mentioned above, the general term 'armature members', in order to stress that other members 20 can be employed instead of the pipe members or coupling pieces illustrated herein.

The sealing arrangement 10 can be utilised for arbitrary sealing purposes, with different requirements for sealing pressures and with different requirements for variations in sealing pressures and different requirements for variations in temperature conditions.

25 The sealing arrangement 10 is utilisable in principle for sealing off internally for preventing leakage of medium from within and outwards, as well as for external 30 sealing for preventing leakage of medium from outside and

inwards. In the illustrated embodiment however there is only shown a construction for internal sealing.

If desired there can be employed a first, radially inner sealing ring against internal excess pressure and a second, radial outer sealing ring against external excess pressure, each sealing ring being based on the sealing arrangement according to the present invention.

The sealing arrangement 10 can be specifically utilised for equipment which can be exposed to significant variations in internal and external medium pressure and/or significant variations in external and internal temperature conditions. The solution for example shall be able to be utilised under temperature variations of 40 - 50°C or more. In this connection it is considered specifically for use in desert regions with extremely high day temperatures and rather low night temperatures. Furthermore it is considered for use in Arctic or similar cold regions of application, where at certain times of the year there can occur extremely low temperatures.

The T-shaped, relatively rigid and relatively shape-stable sealing ring 13 of the sealing arrangement can be made of largely arbitrary, relatively rigid material, such as metal, plastic, glass or the like. Preferably the sealing ring 13 is made of the same material as the armature members 11,12 or of a material having a similar or largely corresponding coefficient of heat expansion.

The said four members 11,12,13,30 have a common longitudinal axis 10a. Three members 11 - 13 each have their mutually flush, cylindrical inner faces 11a, 12a, 13a. The locking device 30 is arranged radially just

outside the armature members 11,12 in a region where these overlap each other.

The sealing ring 13 is, as shown in Fig. 1 in a condition ready for use, received in a downwardly opening layer 11b (see Fig. 1a) of the one armature member 11. The layer 11b is defined between a first, radially extending, axially facing, innermost guide face 19 and a second, radially extending, axially facing, outermost guide surface 20 and an intermediate, stop-forming conical face 21 plus a radially facing cylindrical, outermost lying support face 22. The conical face 21 passes at a cone angle  $\alpha$  relative to the longitudinal axis 10a of the sealing arrangement 10.

The armature member 12 is, as shown in Fig. 1a, provided with an upwardly opening layer 12b, which comprises a first, radially extending, axially facing, innermost guide surface 23 and a second, radially extending, axially facing outermost guide surface 24 and an intermediate, stop-forming cone face 25, which extends equivalently at a cone angle  $\alpha$  relative to the longitudinal axis 10a.

As shown in Fig. 1 and 1a the armature member 11 has a skirt portion 26, which overlaps a peripheral portion 27 of the armature member 12 in a region axially within end face 23 of the armature member 12.

The armature members 11 and 12 are provided with two pairs of equivalent cylindrical guide faces 26a, 27a and 26b, 27b having mutually adapted degrees of fit. The armature members 11,12 form mutually supporting abutments via conical stop faces 26c, 27c of a transition portion

between the pairs of the guide faces 26a, 27a; 26b, 27b.

In the pushed together condition the armature members 11,12 are closed off having mutual support in the axial direction via the stop faces 26c, 27c. After mounting by  
5 means of the clamping device 30 the armature members 11,12 are closed off in the opposite axial direction.

In Fig. 1 and 2 the clamping device 30 of the sealing arrangement 10 is shown designed with a sleeve-shaped clamping member 31, which is rotatably mounted via a  
10 collar portion 32, which projects inwardly into an annular groove 33 on the armature member 11. The annular groove 33 is defined between a shoulder portion 34 on the armature member 11 and a two-piece, stop-forming ring 35, which is locally fastened to the armature member 11 via radially  
15 extending fastening means 36.

In the use position of the sealing arrangement the end face 31a of the clamping member 31 is closed tightly up to an axially facing side face 37a of a two-part, stop-forming ring 37, which is locally fastened to the second  
20 armature member 12 in an associated annular groove 38 via radially extending fastening means (not shown further).

Along the lower outer side of the clamping member 31 there is fastened a cover member 39 via radially extending fastening means 40. By means of the cover member 39 a gap  
25 41 can be sealed off between the clamping member 31 and the ring 37. Along the upper outer side of the clamping member 31 there is fastened to the clamping member 31 a sleeve-shaped hand grip portion 42 having projections 43 projecting radially outwards.

On the inner side (see Fig. 5) of the clamping member 31 there are arranged lowermost a series (four shown herein) of clamping means 44 projecting radially inwards, which are mutually separated by a corresponding number (four) of intermediate spaces 45.

On the outer side (see Fig. 4) of the armature member 12 there project radially outwards a series (four) of mutually separated clamping means 46, which are mutually separated by (four) intermediate spaces 47.

10 In the illustrated embodiment the clamping means 44 are provided with an axially facing, radially extending, elongate and plane clamping face 48.

The clamping means 46 are provided on their corresponding, axially facing clamping faces with an corresponding axially facing, radially extending, elongate and plane clamping face. In practice and as is shown in Fig. 12a - 12d the last-mentioned clamping face comprises a relatively short, radially extending wedge surface 49 and a following, considerably longer, radially extending support surface 50.

In sealing rings of steel, aluminium or other metal preferably mechanical clamping devices (not shown further) are employed in connection with the axial clamping together of the armature members 11,12, while in addition the clamping device 30 is employed in order to rotate the clamping means 44,46 (see Fig. 12a - 12d) into place in mutual locking positions (Fig. 12d).

In another case, where for example sealing rings of plastic are used, the clamping device 30 can be employed both for axial clamping together of the armature members

11,12 and for locking together of the clamping means 44,46. In the last-mentioned case the wedge face 49 is employed in connection with the clamping together of the armature members 11,12.

5 In an introductory phase of the coupling together of the armature members 11,12 (see Fig. 12a) the clamping member 31 is rotated relative to the armature members 11,12 about the axis 10a, so that its clamping means 44 can be pushed axially inwards into the intermediate spaces 10 47 between the clamping means 46 of the armature member 12.

Thereafter the armature member 12 is pushed axially inwards into the armature member 11 and its clamping member 31, as is indicated by an arrow A in Fig. 12b.

15 The clamping member 31 is thereafter turned, as is shown by the arrow B in Fig. 12c, to the position which is shown in Fig. 12d. By means of the wedge face 49 the armature members 11,12 are forced axially together from a position as shown correspondingly in Fig. 10 to a position 20 as shown in Fig. 11.

In the last mentioned position the clamping means 46 of the armature member 12 and clamping means 44 of the clamping member 31 are secured in a mutual locking engagement via the plane clamping faces 48,50. At the same 25 time the armature members 11,12 impact axially together via the stop faces 26c, 27c.

The members 11,12,31 are hereby secured axially in place relative to each other, while there is defined a degree of fit or other adjusted spacing between respective

side faces 14b, 14c of the stem 14 and opposite guide faces 20,23 of the armature members 11,12.

There is hereby ensured an adjustment of the position of the stem 14 relative to the layer 11b and the layer 12b in an axial direction, while the sealing faces 15a and 16a are centered correspondingly in place in an axial direction relative to the conical support faces 21,25 of the armature members 11,12.

In the illustrated embodiment the sealing ring 13 forms a direct abutment only against the conical support face 21 of the armature member 11 and against the conical support face 25 of the armature member 12. The sealing ring 13 has a degree of fit or a larger or smaller spacing from opposite faces 19,20,22 of the layer 11b of the armature member 11 and from the guide face 23 of the layer 12b of the armature member 12.

The sealing ring 13, as shown separately in Fig. 6 - 9, has a substantially T - shaped cross-section with a middle stem 14 and two side wings 15,16. The side wings 15,16 are mutually connected via the middle stem 14 of the sealing ring in and at the inner face 13a.

The stem 14 is provided opposite the inner face 13a, with a cylindrical peripheral face/end face 14a. The end face 14a is adapted to form a slidable support surface for the sealing ring 13 along its periphery via the support face 22 of the armature member 11.

In the illustrated embodiment the cylindrical end face 14a of the sealing ring is provided with a central annular groove 17, which is designed to receive an elastically yielding O - ring 18, which projects radially

just outside the end face 14a. The O - ring 18 can be utilised as the slide member of the sealing ring 13 during mounting in the armature and particularly for retaining the sealing ring 13 in a partially pushed in position, especially on mounting of the sealing ring 13 from below and upwardly into the downwardly opening layer 11b of the armature member 11.

The stem 14, which has a largely rectangular, rigid and compact cross-section, has from each respective end edge of the cylindrical end face 14a a radially extending, axially facing side face 14b and 14c respectively. In practice the side face 14b is arranged at a certain distance from the opposite guide face 20 of the armature member 11. Correspondingly the side face 14b is arranged at a certain distance from its opposite guide face 24. The distance between each side face/guide face pair can be minimal, that is to say in the degree of fit order of magnitude or at a certain distance, for example 1 - 3 mm in sealing rings having a relatively large diameter.

From one side face 14b of the stem 14 there projects laterally outwards a first sealing face in the form of a conical face 15a of the one side wing 15. From the other side face 14c there projects laterally outwards in the opposite direction a second sealing face in the form of a conical face 16a of the other side wing 16. The sealing forming conical faces 15a and 16a of the sealing ring 13 have equivalent dimensions and are designed symmetrically relative to the stem 14.

In the illustrated embodiment sealing faces 15a, 16a of the sealing ring 13 can have the same or substantially

the same cone angle  $\alpha$  as the respective opposite support faces 21,25 of the armature members 11,12. In such a case effective sealing is achieved by moderate axial displacement of the sealing wings 15,16 of the sealing ring 13 along support faces 21,25 of the armature members 11,12 during exertion of a significant radial sealing pressure against the support faces 21,25.

The sealing wings 15,16 are provided with their respective radially extending, axially facing end face 15b, 16b. There are shown (see Fig. 11) end faces 15b, 16b of the side wings 15,16 at a certain axial distance from the guide faces 19 and 23, so that the sealing wings 15,16 can be moved along the conical faces 21,25 axially a certain distance backwards and forwards relative to the faces 19 and 23 during expansion/contraction possibly occurring of the material of the sealing ring 13.

Furthermore in the illustrated embodiment the sealing ring 13 is provided, in diametrically opposite portions of the stem 14, with two axial through bores 17a, 17b including screw threads. The bores 17a, 17b are adapted to be passed through by a spindle having screw threads equivalent to the screw threads of the bores 17a, 17b in order to be able to force the stem 14 of the sealing ring axially away from the adjacent support face of the armature member on dismantling of the sealing ring after use, in the cases where the end face 14a on the stem 14 of the sealing ring 13 exhibits too great a friction against the cylindrical support face 21 of the armature member 11.

According to an alternative embodiment (see Fig. 10 and 11), which can be employed for simple sealing arrange-

ments, but which is preferred in sealing arrangements which are to be employed under high sealing pressures or under other particularly demanding sealing conditions, a sealing ring 13' has a cone angle  $b$  which is somewhat larger than the cone angle  $a$  of the armature members 11,12.

The pushing together of the armature members 11,12 around the intermediate sealing ring 13' can in this instance take place in a corresponding manner as in the case which is described above. In Fig. 10 the sealing ring 13' is shown in an introductory phase of the pushing together between the armature members 11, 12 and in Fig. 11 the same is shown after ending the pushing together. The gaps between faces 14b, 14c of the sealing ring 13' and opposite faces 20,23 of the armature members 11,12 are shown according to Fig. 11 relatively large, but can in practice be considerably narrower, for example of a degree of fit order of magnitude.

In the illustrated embodiment the sealing ring forms, on the one side of the stem, a sealing abutment via the conical sealing face 15a of the sealing wing 15 against cone face 21 of the armature member 11, while the sealing ring 13, on the opposite side of the stem 14, forms a sealing abutment via conical sealing face 16a of the sealing wing 16 against the cone face 25 of the armature member 12.

In certain cases with simple sealing arrangements, the faces 14a, 14b and 15b, 16b of the sealing ring 13 can form direct support abutments against opposite faces 19,20,22 and 23,24 of the armature members 11,12.

In remaining cases, especially when the question is about sealing arrangements requiring more adjustment, the faces 14a, 14b, 15b and 14c and 16b of the sealing ring 13 can be arranged at a greater or smaller distance from said faces 19,20,22 and 23,24, according to need. This case is indicated for example in the second embodiment according to Fig. 10 and 11.

According to Fig. 10 and 11 a sealing arrangement 10' according to the invention is shown having a sealing ring 13' according to an alternative construction.

A first departure from the first construction, which is illustrated according to Fig. 1 - 9, consists in that prior to mounting the conical sealing faces 15a' and 16a' form a cone angle  $b$ , which differs from the cone angle  $a$  of the conical support faces 21,25.

In that the cone faces 15a, 16a at the starting point, that is to say prior to mounting, form a cone angle  $b$ , which is somewhat larger than the equivalent cone angle  $a$  of the armature members 11,12, the sealing wings 15 and 16 can during mounting be deformed elastically relative to the conical support faces 21,25, so that the sealing faces 15a, 16a coincide with equivalent conical support faces 21,25 of the armature members 11,12 at a common cone angle  $a$ .

During installation of the sealing ring 13' in the armature member 12 the sealing face 15a forms in a first installation phase a minimal abutment against the cone face 25, while adjacent side face 14b of the stem 14 forms a significant space from the opposite face 20 of the armature member 12.

On pushing together the armature member 11 against the armature member 12 about the intermediate sealing ring 13, by means of the clamping device 30, from the position which is shown in Fig. 10 to the position which is shown in Fig. 11, the sealing wings 15',16' of the sealing ring 13' are deformed in an elastically yielding manner against the conical cone faces 21,25 until the sealing faces 15a', 16a' form a tight abutment against the cone faces 21,25. In a position corresponding to that which is shown in Fig. 1, the conical sealing faces 15a, 16a form the same cone angle  $\alpha$  as the cone faces 21,25 of the armature members 11,12, as is shown in Fig. 11.

By arranging for a certain degree of fit between end face 14a of the sealing ring 13' and support face 22 of the armature member 11 one can ensure that the stem 14 of the sealing ring can make a certain axial adjustment if necessary and be centered in place in a middle position between the armature members 11,12, as is illustrated in Fig. 11. In this connection, without this being specifically illustrated in the drawing, larger or smaller spaces can be employed between the faces 14b,22 and between the faces 14c,24, according to need.

In the construction according to Fig. 10 and 11 provision is made, as an extra, alternative possibility, for a respective portion of the sealing face 13a' of the sealing wings 15',16' to have prior to mounting a conical outline at a cone angle  $b$ , so that said portions of the sealing face 13a' receive after mounting, that is to say after the sealing wings 15',16' are elastically deformed

relative to the support faces 21,25 a flush outline with the guide surfaces 11a, 12a of the armature members 11,12.

In the construction according to Fig. 10 and 11 an endwise support abutment is employed between the armature members 11,12 via radially extending support faces 20',25' instead of the support abutment between the cone faces 26c, 27c of the first embodiment.

Patent Claims

1. Sealing arrangement (10,10') comprising two  
5 separate armature members (11,12) and a sealing ring  
(13,13') interposed therebetween and a clamping device  
(30) for clamping the armature members (11,12) against  
each other causing the intermediate sealing ring (13,13')  
10 to be loaded with a sealing force, said sealing ring  
(13,13') being made of metal or similar material and  
having a substantially T-shaped annular cross-section,  
said T-shape being provided with two in opposite axial  
direction extending sealing wings (15,16), each with an  
15 radially outwards facing sealing face (15a,15b), and  
therebetween a central, rather rigid stem (14) extending  
radially outwards and being provided with a combined  
gliding and support face (14a) to be supported against a  
counter face (22) in the sealing arrangement, each of said  
20 sealing faces (15a,15b) being conically shaped to be  
supported against a radially surrounding, correspondingly  
conically shaped gliding and support face (21,25) in a  
corresponding armature member (11,12), each of said  
conical support faces (21,25) of said armature members  
(11,12) extends under a first, smallest cone angle (a),  
25 whereas each of said said sealing wings (13,13') extends  
under a second, greatest cone angle (b), prior to  
mounting, and after mounting extends under said first cone  
angle (a) to form a tight sealing abutment against its  
corresponding support face (21,25), characterised in that  
30 each sealing face (15a,16a) of said sealing ring  
(13,13') has the same axial extension as that of the  
associated sealing wing (15,16), and  
each sealing face (15a,16a) has a continuous,  
rectilinear extension in axial direction of the sealing  
35 wing (15,16), and  
each sealing wing (15a,16a) is tapering in axial  
direction from the stem (14) and is elastically deformable  
in relation to the stem (14) in order to secure a

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controlled elastic deformation of the sealing wing (15,16).

2. Arrangement in accordance with claim 1,  
5 characterised in that

each sealing wing (15,16) in radial direction has a relatively small cross-sectional dimension, increasing from a minimum at its outer end portion to a maximum at its inner end portion by the stem (14), and

10 each sealing wing (15,16) in a axial direction has a relatively large cross-sectional dimension, to obtain support of the sealing wings (15,16) along a major area of the respective support surfaces (21,25),

both cross-sectional dimension being relative in  
15 respect of the cross-sectional dimensions of the stem (14), which in axial as well as in radial direction is relatively large to provide a rather rigid stem (14).

3. Arrangement in accordance with claim 1 or 2,  
20 characterised in that

the counter face (22) extends continuously in axial direction and solely in one of the armature members (11,12), providing a continous gliding support for the support face (14a) of the stem (14) directly against said  
25 counter face (22).

4. Arrangement in accordance with one of claims 1-3,  
characterised in that

the clamping means (30) comprises two in radial  
30 direction mutually overlapping armature member portions (26,27) extending radially outside of the sealing ring (13,13'),

said armature member portions (26,27) is supporting each other along mutually opposite conical support  
35 surfaces extending obliquely with a central axis of the sealing arrangement to provide a controlled stopp forming abutment between the armature member (11,12).

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5. Arrangement in accordance with one of claims 1-3  
and claim 4, characterised in that

the combination of the oblique extension of said  
mutually overlapping, stop forming armature member  
5 portions (26,27) and said elastically deformable wings  
(15,16) of the sealing ring (13,13') to provide controlled  
gliding movements in the sealing arrangement during use.

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FIG. 1

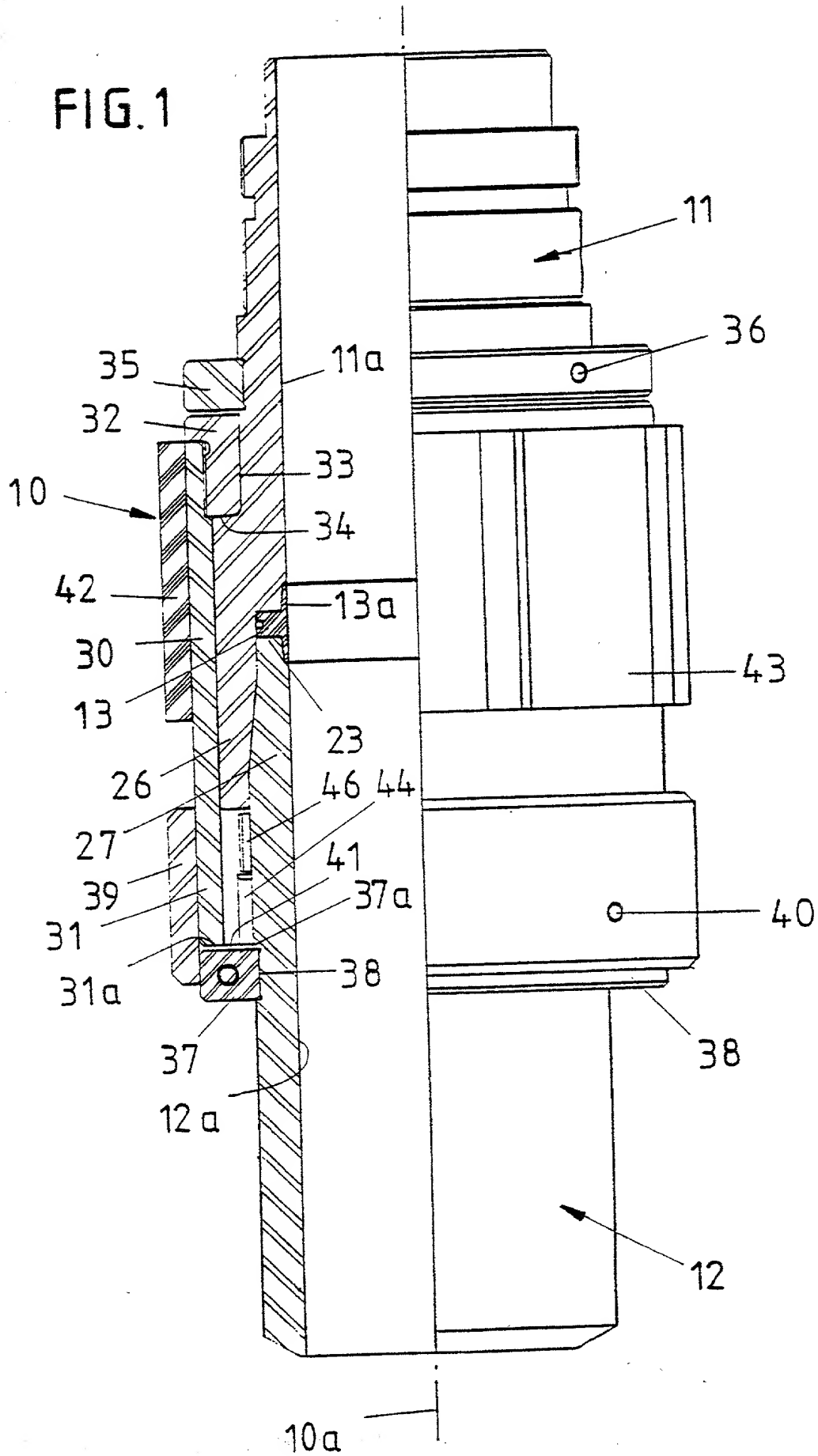


FIG. 1a

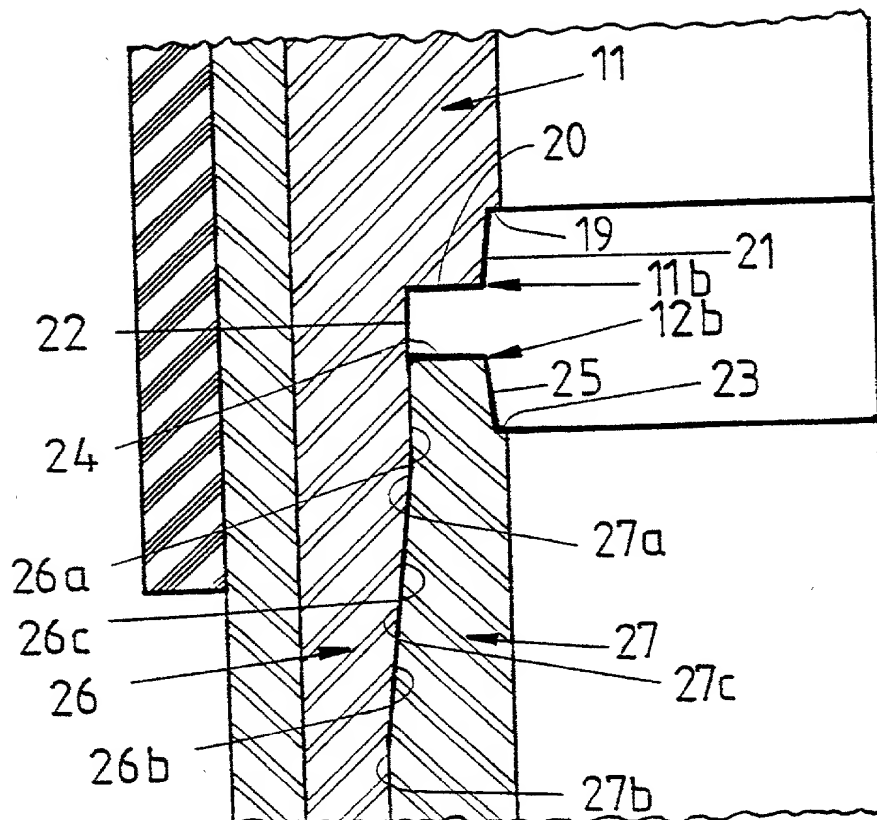


FIG. 2

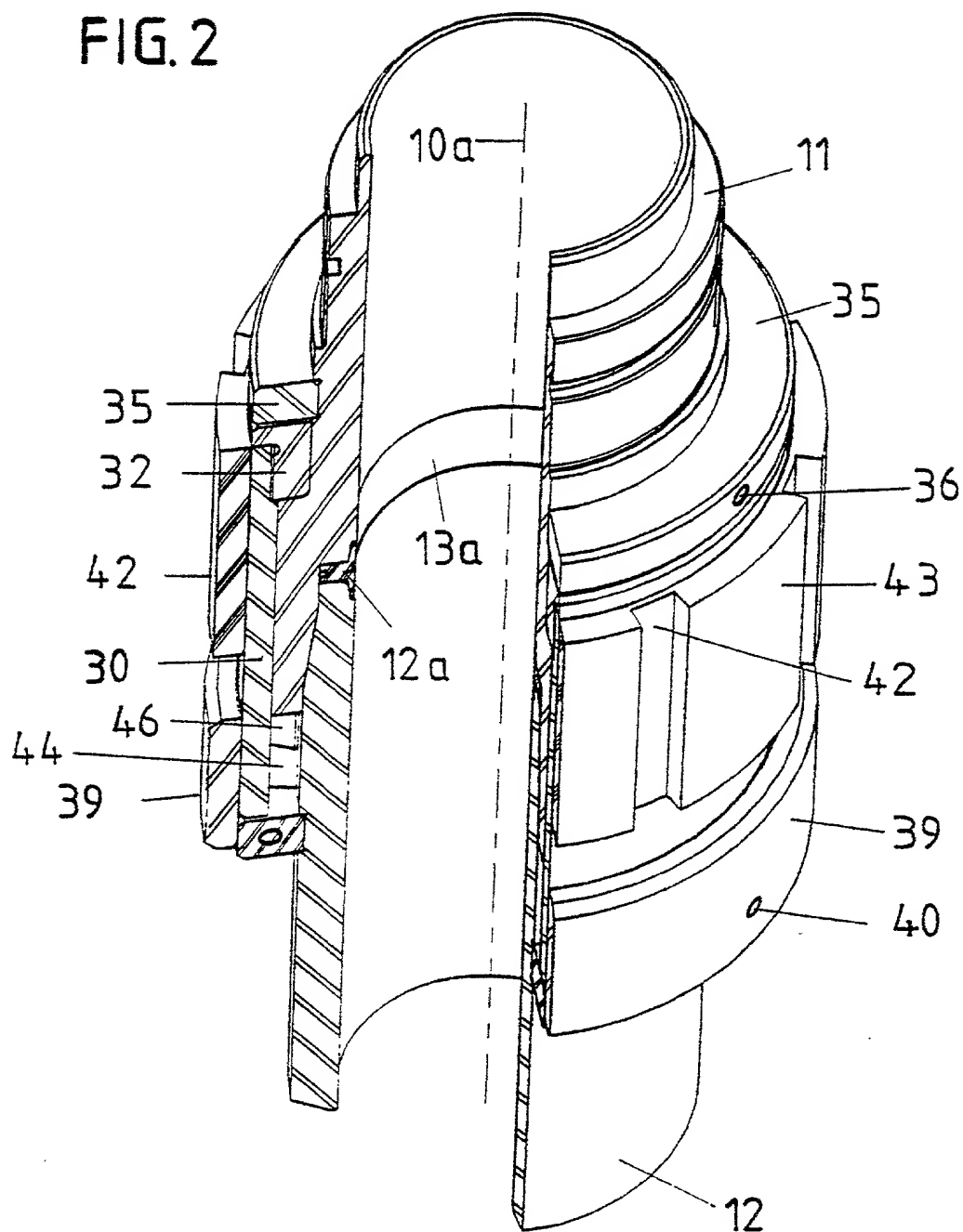
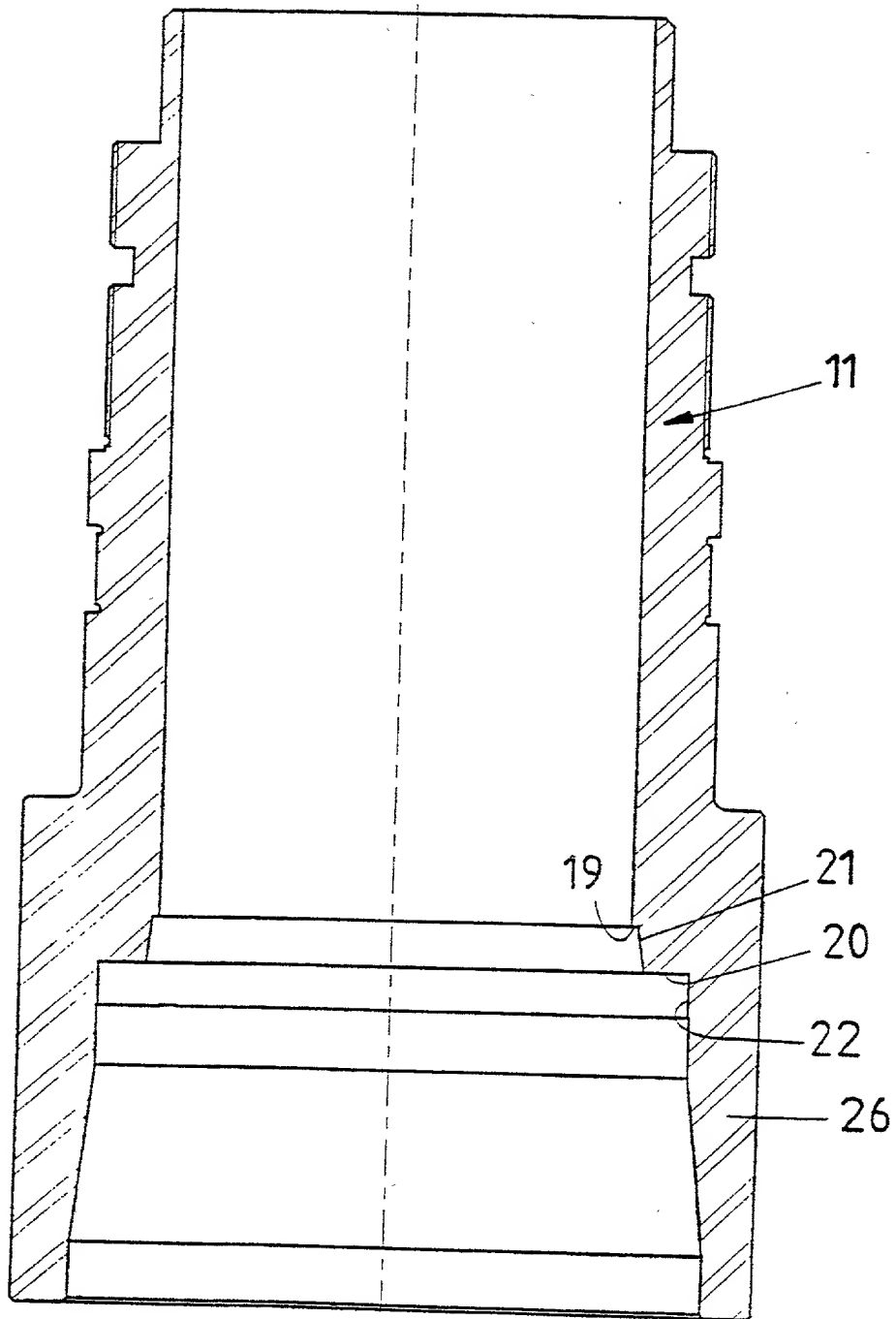


FIG.3



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FIG. 4

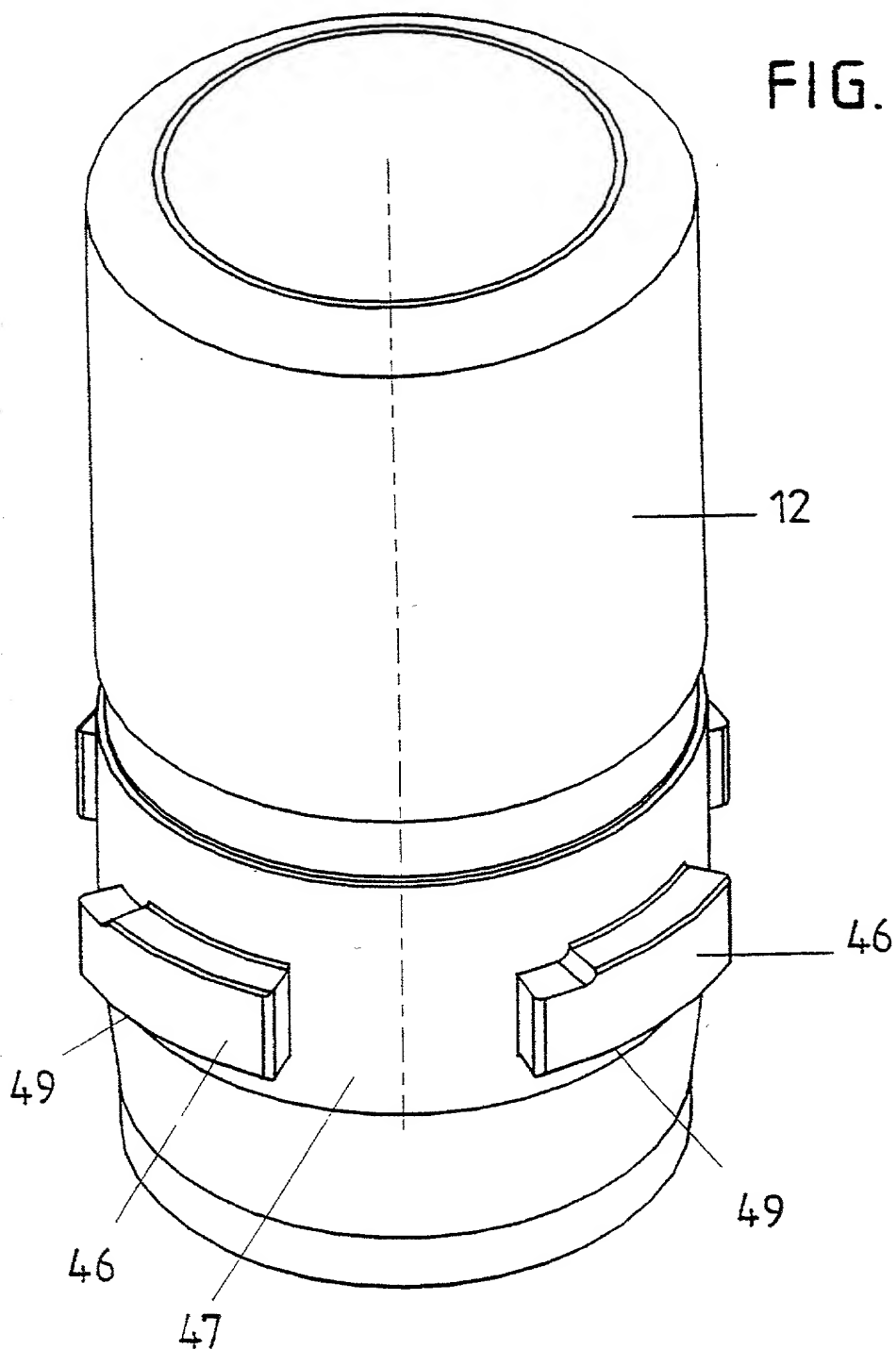


FIG.5

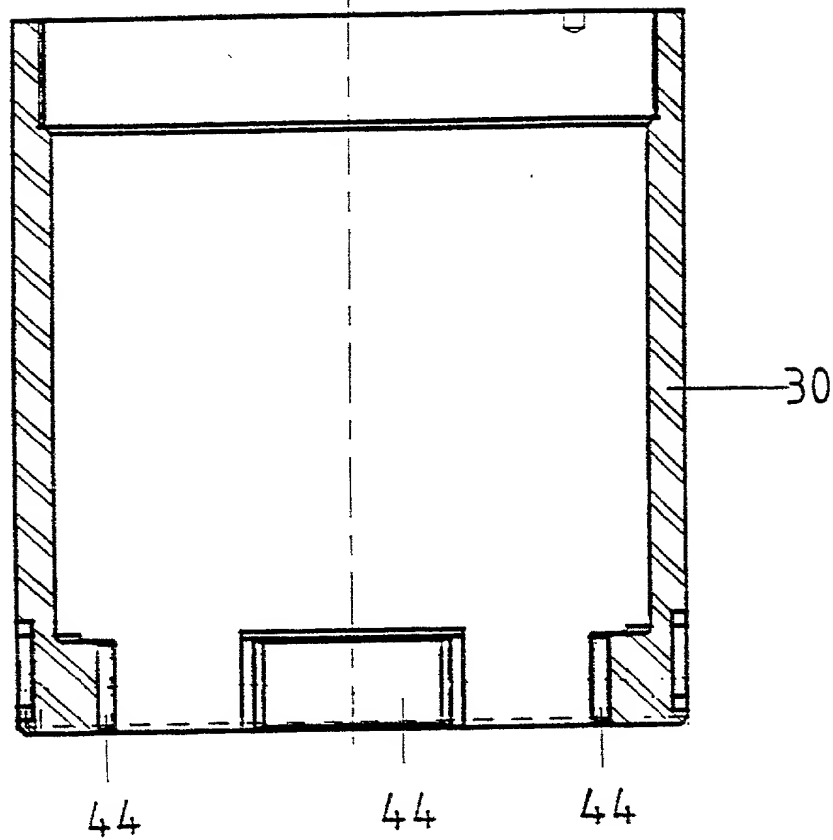


FIG.5a

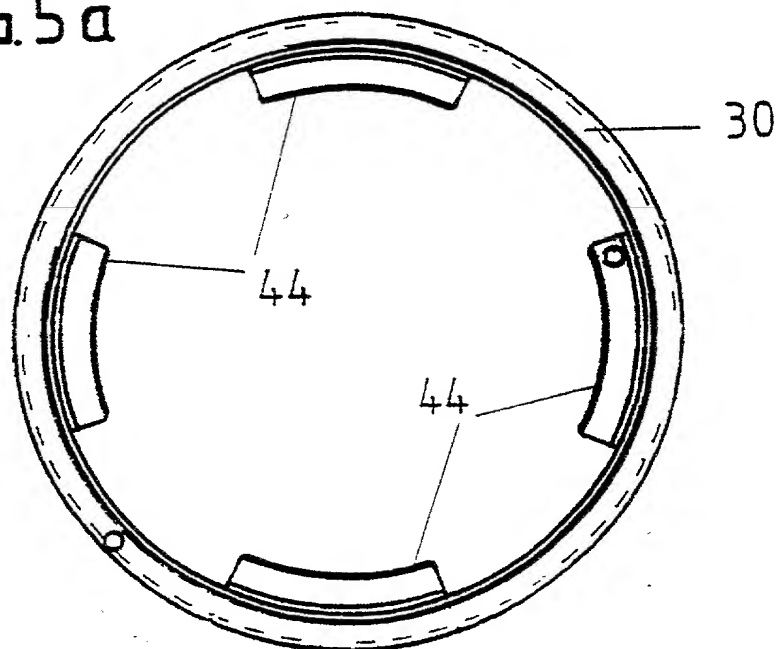


FIG. 6

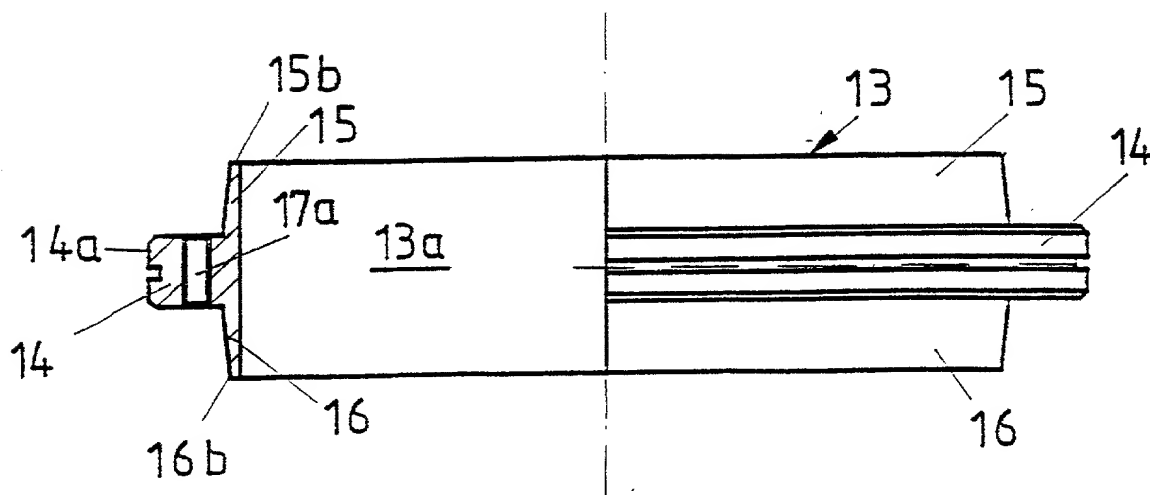
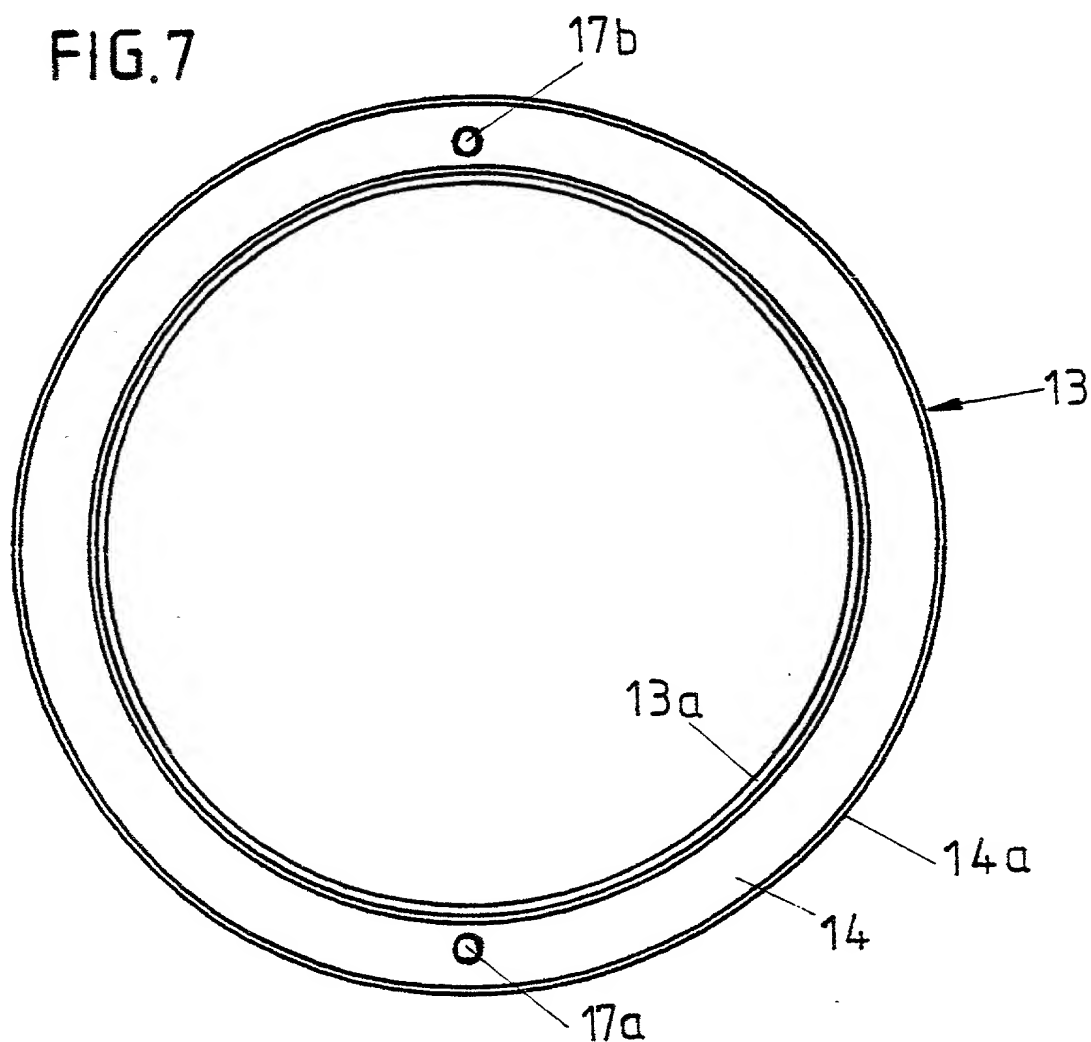


FIG. 7



09/889755

# ARTINCA ANUL

FIG. 8

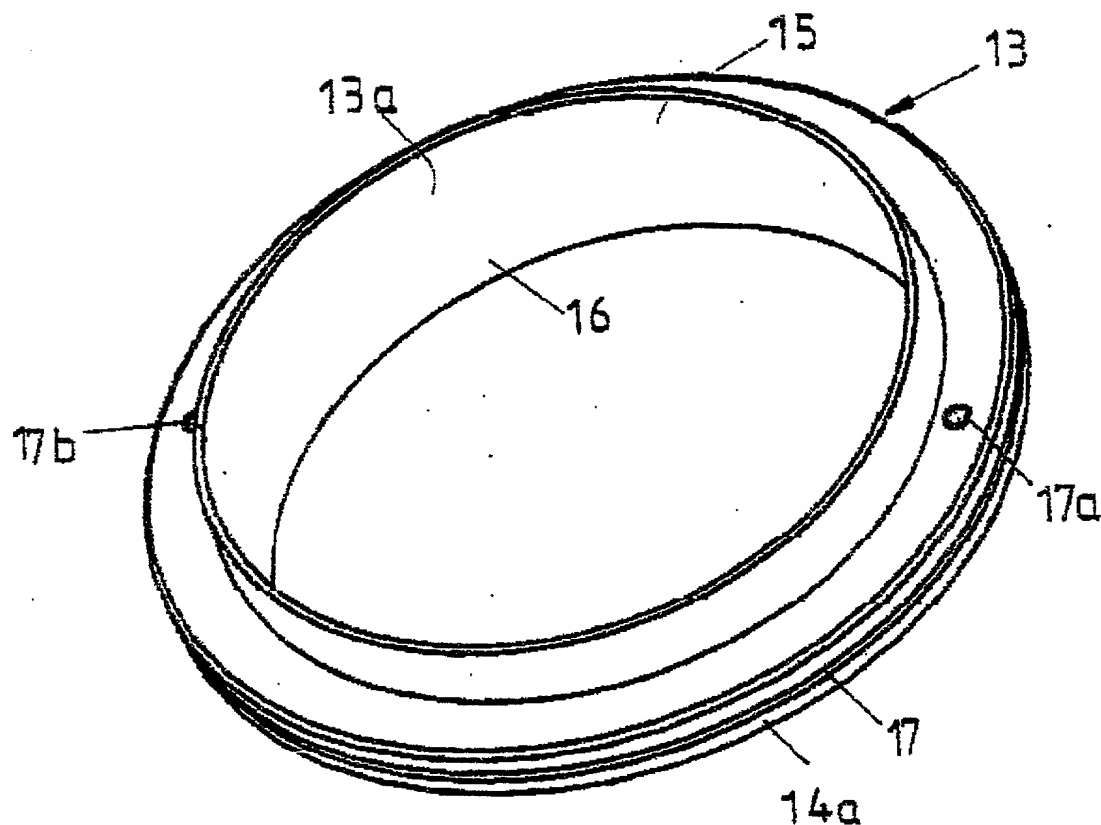
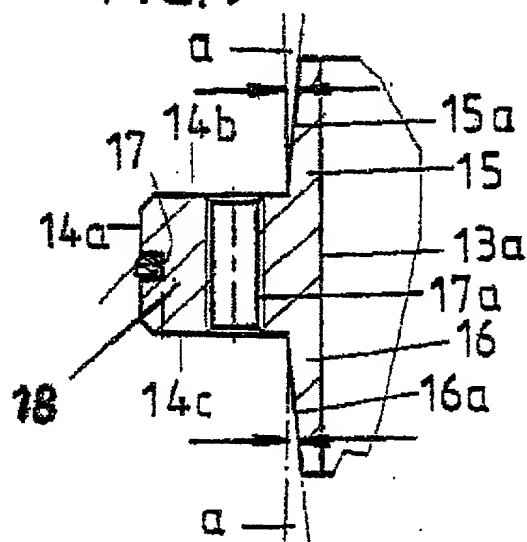
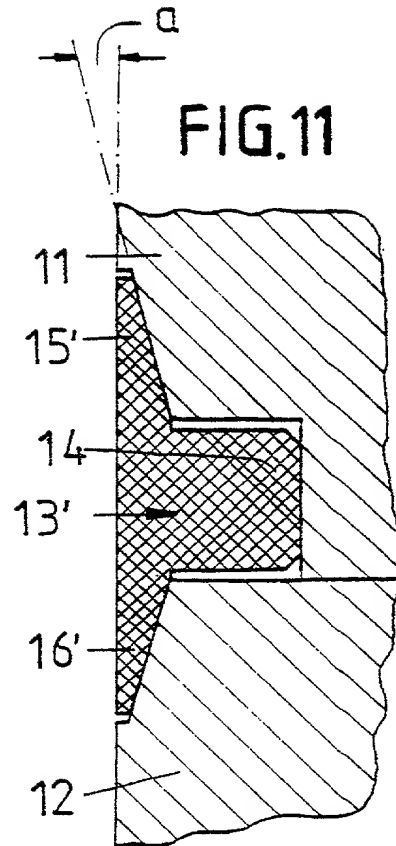
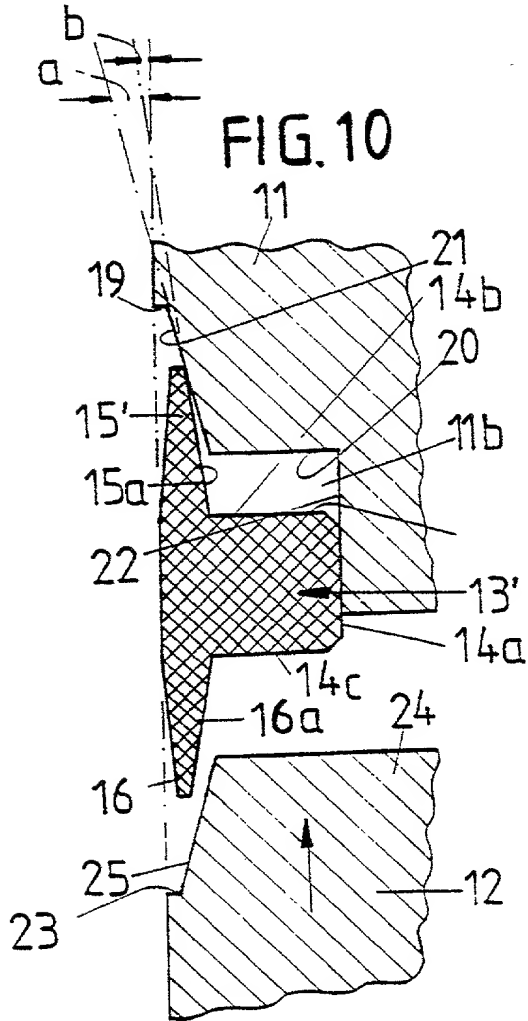
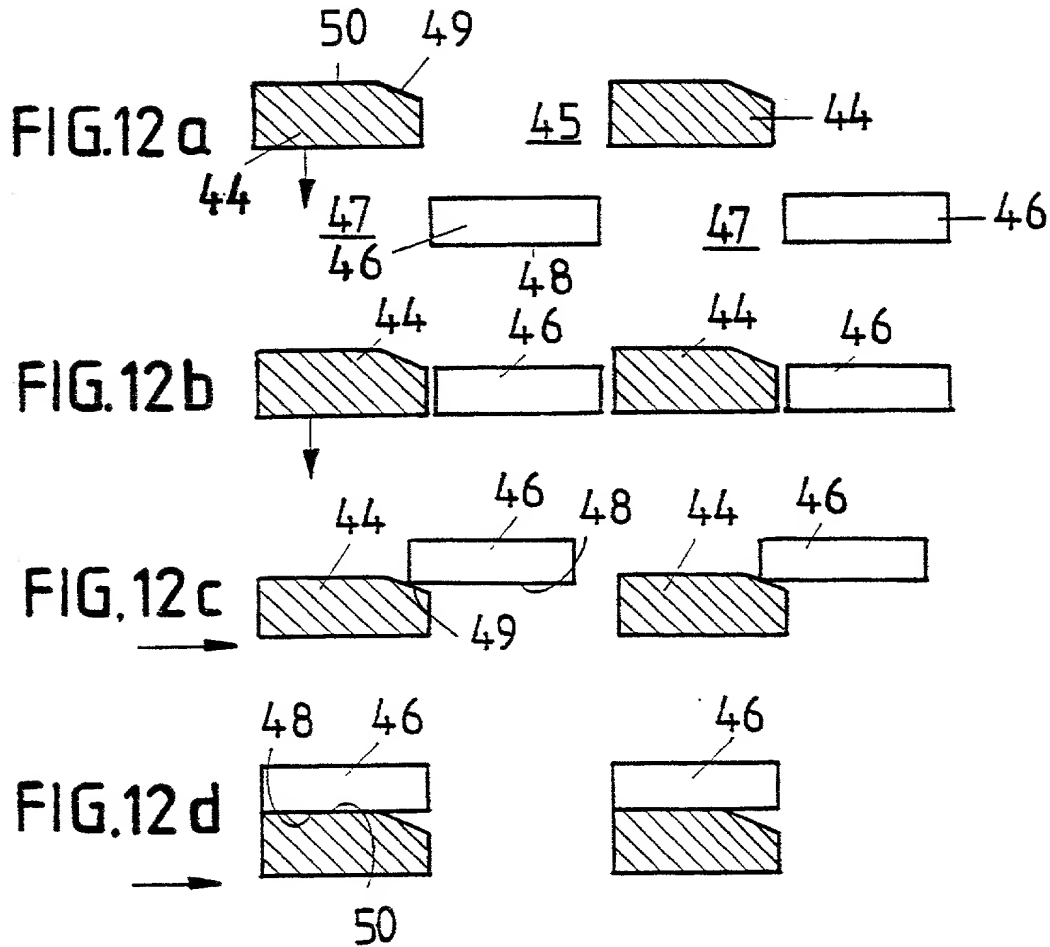


FIG. 9







Optional Customer No. Bar Code



00140

PATENT TRADEMARK OFFICE

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**COMBINED DECLARATION AND POWER OF ATTORNEY**

---

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,  
CONTINUATION, OR C-I-P)

---

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is of the following type:

*(check one applicable item below)*

- ☐ original.  
☐ design.

**NOTE:** *With the exception of a supplemental oath or declaration submitted in a reissue, a supplemental oath or declaration is not treated as an amendment under 37 CFR 1.312 (Amendments after allowance). M.P.E.P. Section 714.16, 7<sup>th</sup> Ed.*

- ☐ supplemental.

**NOTE:** *If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.*

- ☒ national stage of PCT.

**NOTE:** *If one of the following 3 items apply, then complete and also attach **ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P***

**NOTE:** *See 37 C.F.R. Section 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.*

- ☐ divisional.  
☐ continuation.

**NOTE:** *Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. Section 1.53(b) (application filing requirements-nonprovisional application).*

- ☐ continuation-in-part (C-I-P).

## INVENTORSHIP IDENTIFICATION

**WARNING:** If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

### TITLE OF INVENTION

SEALING ARRANGEMENT

### SPECIFICATION IDENTIFICATION

The specification of which:

(complete (a), (b), or (c))

(a) ☐ is attached hereto.

**NOTE:** "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. Section 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) ☐ was filed on \_\_\_\_\_, ☐ as Application No. \_\_\_\_\_  
☐ and was amended on \_\_\_\_\_ (if applicable).

**NOTE:** Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 C.F.R. Section 1.67.

**NOTE:** "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. Section 1.63.

(A) application number (consisting of the series code and the serial number, e.g., 08/123,456);

(B) serial number and filing date;

(C) attorney docket number which was on the specification as filed;

(D) title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

(E) title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number, e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration

M.P.E.P. Section 601.01(a), 7th ed.

- (c) ☒ was described and claimed in PCT International Application No. NO00/00017 filed on January 26, 2000 and as amended under PCT Article 19 on \_\_\_\_\_ (if any).

**SUPPLEMENTAL DECLARATION (37 C.F.R. Section 1.67(b))**

*(complete the following where a supplemental declaration is being submitted)*

☐ I hereby declare that the subject matter of the

☐ attached amendment

☐ amendment filed on \_\_\_\_\_.

was part of my/our invention and was invented before the filing date of the original application, above identified, for such invention.

**ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, Section 1.56,

*(also check the following items, if desired)*

☐ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. Section 1.98.

**PRIORITY CLAIM (35 U.S.C. Section 119(a)-(d))**

**NOTE:** "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by Section 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. Section 119(b) must be filed in the case of an interference (Section 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in Section 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. Section 1.55(a)

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

*(complete (d) or (e))*

- (d) ☐ no such applications have been filed.  
 (e) ☒ such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

**PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS  
 (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION  
 AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. SECTION 119(a)-(d)**

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING DAY, MONTH, YEAR	PRIORITY CLAIMED UNDER 35 USC 119
Norway ✓	19990388 /	28 January 1999 /	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

**CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)  
 (35 U.S.C. Section 119(e))**

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

**PROVISIONAL APPLICATION NUMBER**

**FILING DATE**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**CLAIM FOR BENEFIT OF EARLIER U.S./PCT APPLICATION(S)  
 UNDER 35 U.S.C. SECTION 120**

- ☐ The claim for the benefit of any such applications are set forth in the attached  
 ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY  
 FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P)  
 APPLICATION.

ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. Section 120.

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

JOSEPH H. HANDELMAN, 26179

JULIAN H. COHEN, 20302

JOHN RICHARDS, 31053

WILLIAM R. EVANS, 25858

RICHARD J. STREIT, 25765

JANET I. CORD, 33778

PETER D. GALLOWAY, 27885

CLIFFORD J. MASS, 30086

LAIN C. BAILLIE, 24090

CYNTHIA R. MILLER, 34678

RICHARD P. BERG, 28145

(Check the following item, if applicable)

- ☐ I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.
- ☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

NOTE: "Special care should be taken in continuation or divisional applications to ensure that any change of correspondence address in a prior application is reflected in the continuation or divisional application. For example, where a copy of the oath or declaration from the prior application is submitted for a continuation or divisional application filed under 37 CFR 1.53(b) and the copy of the oath or declaration from the prior application designates an old correspondence address, the Office may not recognize, in the continuation or divisional application, the change of correspondence address made during the prosecution of the prior application. Applicant is required to identify the change of correspondence address in the continuation or divisional application to ensure that communications from the Office are mailed to the current correspondence address. 37 CFR 1.63(d)(4)." Section 601.03, M.P.E.P., 7th Ed

SEND CORRESPONDENCE TO

Ladas & Parry  
26 West 61<sup>st</sup> Street  
New York, N.Y. 10023

DIRECT TELEPHONE CALLS TO:  
(Name and telephone number)

WILLIAM R. EVANS  
212-708-1930

(complete the following if applicable)

Since this filing is a [ ] continuation [ ] divisional there is attached hereto a Change of Correspondence Address so that there will be no question as to where the PTO should direct all correspondence.

#### DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**SIGNATURE(S)**

*NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other document.*

NOTE: Each inventor must be identified by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and by his/her residence, post office address and country of citizenship 37 C.F.R. Section 1.63(a)(3).

NOTE: *Inventors may execute separate declarations/oaths provided each declaration/oath sets forth all the inventors. Section 1.63(a)(3) requires that a declaration/oath, inter alia, identify each inventor and prohibits the execution of separate declarations/oaths which each sets forth only the name of the executing inventor. 62 Fed. Reg. 53,131, 53,142, October 10, 1997.*

**Full name of sole or first inventor**

OLE  
(Given Name)

HJERTHOLM  
(Middle Initial or Name)

HJERTHOLM  
Family (Or Last Name)

Inventor's signature (X) *Wm J. Githner*

Date (X) 3/10-2001 Country of Citizenship NORWAY ✓

**Residence** LEPSØYNESET, N-5228 LEPSØY, NORWAY NOX

Post Office Address SAME AS ABOVE

**Full name of second joint inventor, if any**

(Given Name)                      (Middle Initial or Name)                      Family (Or Last Name)

**Inventor's signature** \_\_\_\_\_

Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_

Residence \_\_\_\_\_

Post Office Address \_\_\_\_\_

Full name of third joint inventor, if any

(Given Name)                      (Middle Initial or Name)                      Family (Or Last Name)

**Inventor's signature** \_\_\_\_\_

Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_

Residence \_\_\_\_\_

Post Office Address \_\_\_\_\_

(check proper box(es) for any of the following added page(s)  
that form a part of this declaration)

☐ Signature for fourth and subsequent joint inventors. Number of pages added \_\_\_\_\_

\* \* \*

☐ Signature by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. Number of pages added \_\_\_\_\_

\* \* \*

☐ Signature for inventor who refuses to sign or cannot be reached by person authorized under 37 C.F.R. Section 1.47. Number of pages added \_\_\_\_\_

\* \* \*

☐ Added page for signature by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 C.F.R. Section 1.47)

\* \* \*

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added \_\_\_\_\_

\* \* \*

☐ Authorization of practitioner(s) to accept and follow instructions from representative.

(If no further pages form a part of this Declaration,  
then end this Declaration with this page and check the following item)

☒ This declaration ends with this page.